ORIGINAL
FILE 87-268

Status Report

EIA IS-15 MULTIPORT STANDARD

Significant progress is being made toward updating IS-15 in order to re-issue it as a full standard later this year. One major achievement at the March 16th meeting was a consensus agreement to replace the current option of R-G-B inputs with both Y/C **and** Y/R-Y/B-Y. This will be the only option allowed in the new Multiport implementation. The former R-G-B designated pins will now support both Y/C and Color Difference with the necessary control logic to switch between the two.

The one remaining major effort is to define a means of communicating, via the remote control, with the decoder to support pay-per-view functions. The original concept of passing through the "raw" IR data has been rejected and the current idea is to provided a limited data-set (i.e., the numerals "0" - "9") to the decoder. In order to reach an agreement in a timely matter the group has decided to investigate existing similar implementations, such as the Videocipher receiver-to-decoder protocol, to see if one can be modified or adopted.

The next scheduled meeting will be in Chicago on May 4, immediately following the NCTA Cable Convention to be held in LA.

T.D.M.
March 15, 1988

Y/C INPUT
for
Super VHS

1. Connector: 4 Pin minature DIN

2. Luminance (Y): 1 Volt Peak-to-Peak ± 20%
Negative Sync, 75 Ohm

3. Chroma (C): 3.58 MHz, Burst 0.286 Volt Peak-to-Peak
± 20%, 75 Ohm

NOTICE OF MEETING

Electronic Industries Association

March 8, 1988

ORGANIZATION: R-4 Interface Working Group

CHAIRMAN: William Lagoni, GE/RCA Consumer Electronics

DATE: Wednesday, March 16, 1988

TIME: 9:30 A.M. - 5:00 P.M.

LOCATION: Ramada O'Hare Hotel
6600 North Mannheim Road
Rosemont, Illinois 60018
(312) 827-5131

NOTE: A block of rooms have been reserved under Electronic Industries Assosciation. Please reference EIA when making your reservations. Make reservations as soon as possible.

Please check and sign this stub and return to Mr. Tom Mock at Electronic Industries Association by March 14, 1988.

Tom Mock
Electronic Industries Association
2001 Eye Street, N.W.
Washington, D.C. 20006

R4- Interface Working Group
Wednesday, March 16, 1988
____I will, ____I will not
attend the above meeting

_____
Name

_____
Company

CEG-88-23
43454

ELECTRONIC INDUSTRIES ASSOCIATION CONSUMER ELECTRONICS GROUP

Minutes of the Meeting
of the
Television Receiver Committee (R-4)
Audio/Video Baseband Interface Working Group

February 17, 1988 Ramada O'Hare Hotel Chicago, IL

PRESENT

William Lagoni, Chairman	TCE (RCA)
Bob Burroughs	Panasonic Technology
William Miller	Philips Consumer Elec
Bob Wolff	MIC
Mark Rumreich	TCE (RCA)
Dave Walker	Zenith
Vito Brugliera	Zenith
Brian James	NCTA
Julius Szakolczay	Mitsubishi
Dave Wachob	General Instrument
George Hart	Rogers
Walt Ciciora	ATC
Susumo Yasuda	Toshiba
Mike Watson	Sony
Tom Mock	EIA/CEG

The Chairman called the meeting to order at 9:30 a.m. and the following agenda was adopted:

1. Approval of Agenda
2. Approval of Minutes of previous meeting
3. Status update on MultiPort implementation
4. Update on Zenith/RCA compatibility issue
5. Sony/Mitsubishi AGC/DRS analysis (DEFERRED)
6. Final review of DRS verbiage
7. Finalization of control logic
8. Review IR proposal
9. Review Y/C - Color Difference proposal
10. New business

AGENDA ITEMS:

2. The minutes were approved as written.

3. There was a request that each of the manufacturers in attendance present an update as to their plans for the implementation of the MultiPort in their products.

Matsushita indicated that there was a high degree of reluctance on the part of their VCR engineers/designers to accept the values proposed in the proposed IS-23. It was the general consen-

sus of those present that something must be done to get the attention of the off-shore engineers and designers to make them aware of the environment in which their products must operate in the U.S. marketplace, particularly when connected to CATV systems. Matsushita Industrial Corporation (MIC) announced that they would be introducing the MultiPort on 6 Panasonic receivers (4 - 31" consoles, 2 - 31" portables) and 2 Quasar receivers (31" consoles).

Zenith Electronics and Philips Consumer Electronics (formerly NAP) indicated that they are in a "holding" mode as far as introducing MultiPort equipped products.

Thomson Consumer Electronics (formerly RCA) is looking at a second generation implementation.

Toshiba has plans to introduce one model, hopefully this fall. It was indicated that unless the open issues revolving around the standard (i.e., IR pass-thru and Y/C) are resolved soon, there may be a delay in the introduction.

Mitsubishi is 4-6 weeks away from a decision point. There is a good chance for a few models in '89. They stressed the need for a resolution on the Y/C issue and indicated that this could have a positive impact.

Sony indicated no immediate plans for implementation. They have a completed design ready for implementation when the decision to do so is made.

In general, there was an expression of concern for how long the television receiver manufacturers would be willing to bear the burden of implementing the MultiPort until the other forces in the equation come into play to create a viable marketplace for such products.

As to the decoder manufacturers present, Zenith indicated that it was at least 6-8 weeks away from final repackaging prior to introducing prototypes and General Instrument stated that they are still in the process of testing their two implementations.

ATC indicated that it has placed orders with the major decoder manufacturers and is prepared to support the introduction of products with advertising via video, bill-stuffers, print and in their video stores. Rogers stated that they were also attempting to place orders for MultiPort compatible decoders.

The present plans call for the EIA and NCTA to jointly sponsor demonstrations (booths) at the NCTA Convention in Los Angeles (Apr 30 - May 3) and at the SCTE Expo in San Francisco (June 16 - 19). It was suggested that efforts be made to have a "flashier" booth than in the past demonstrations. In particular, it is important that actual production products be used where available and that any prototypes be as close to the final design as possible.

4. Zenith announced that they have successfully reworked their decoder so that it will operate with both the RCA and Panasonic receivers that they have available. It was proposed that both Panasonic (MIC) and Thomson (RCA) work with Zenith to confirm that the new design will work over the full range of production tolerances for these two receivers. It is anticipated that the unit can be re-packaged within six weeks.

5. DEFERRED

6. The proposed DRS verbiage, incorporated in the modified text distributed with the minutes, was reviewed and approved. Two additional corrections/changes made at the meeting were:

- correct typo in 5.18.8, should read 0.5 V
- update 4.18.2 as per 5.18.2

The attached text reflects all the approved changes made to date.

7. Scientific Atlanta, Oak Communications, and Pioneer have indicated that they have no problem with the proposed changes in the control pin logic parameters. Zenith has objections and was requested to look at worse case tolerances versus the current design view.

8. There was considerable discussion regarding the proposal to pass-through the raw output (buffered) of the IR detector to a yet-to-be designated pin in the Multiport connector. No mutually agreeable solution could be arrived at due to differences in implementation among the various receiver manufacturers. It was also determined that it was impractical for the various decoder manufacturers to agree upon a common set of commands for pay-per-view functions at this time. A compromise solution, proposed by George Hart, was to have the receivers de-code the numerals 0 to 9 and present them (in ASCII format) at the to-be-designated pin. This action would take place when the user pressed a button on the remote indicating that the following information was to be passed on to the decoder via the MultiPort. The pay-per-view functions and requests would then be expressed in a numerical code, to be determined by the decoder manufacturer. If they desire, they could interface with the customer via the video display with a menu of functions and the corresponding numerical sequences.

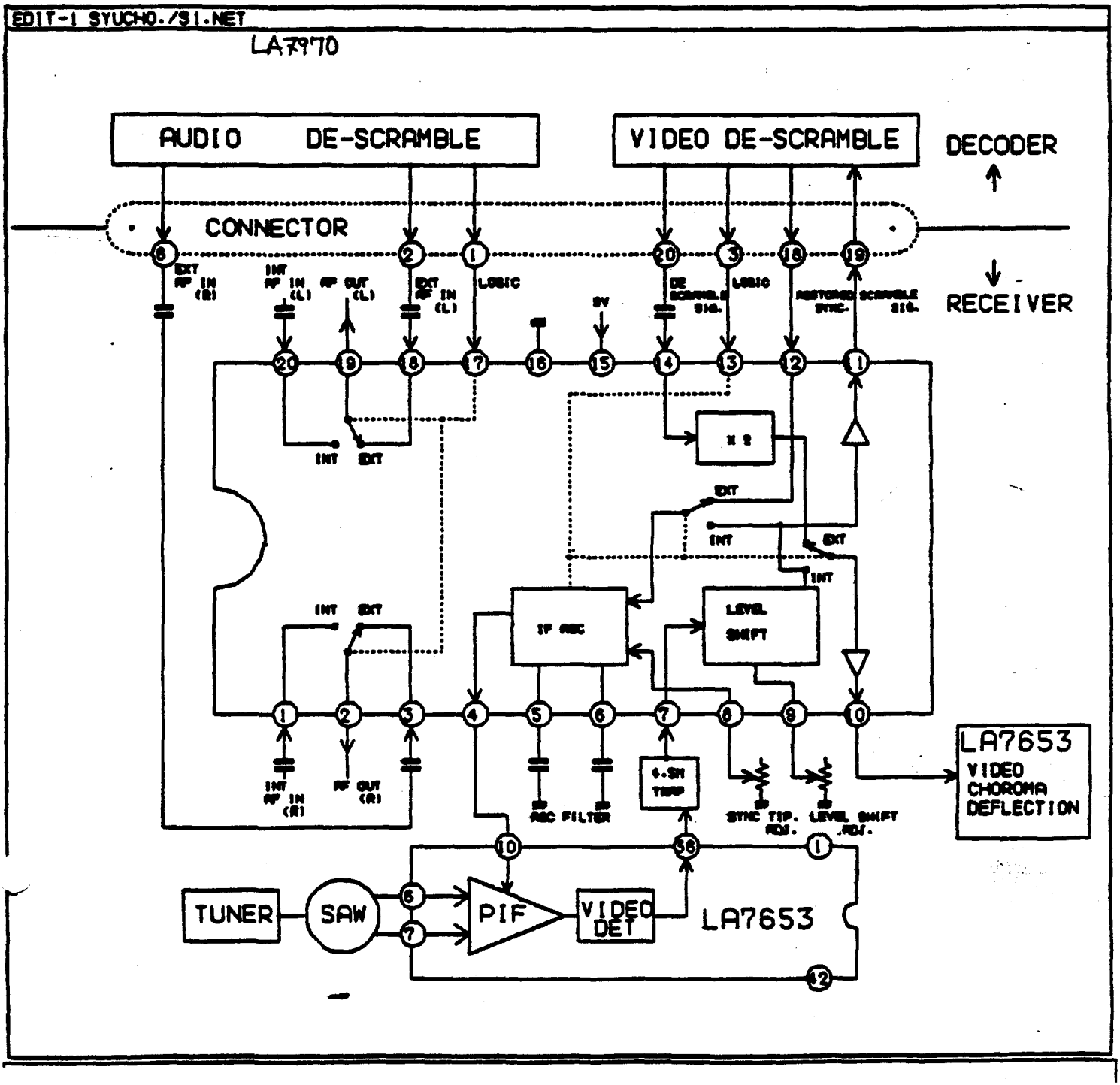
9. There was continuing discussion on the proposal made earlier for the inclusion of Y/C and/or color differences inputs on the MultiPort connector in lieu of the current R-G-B option. Mark Rumreich will re-write a more detailed proposal for presentation at the next meeting. The general consensus is leaning toward changing from R-G-B. One of the issues in question though, is that of options to be allowed in the standard. The less options allowed, the less chance for confusion on part of the consumer.

10. In order to complete the updating of the standard, it was requested that Zenith re-examine the alternative use of the R-G-B pins as now allowed. The next meeting will be held on March 16, 1988 in Chicago. The date for the following meeting was discussed but no firm date was arrived at due to scheduling conflicts.

Being there was no further new business, the meeting was adjourned at 3:30 p.m. This meeting was held in accordance with the EIA Legal Guides and the EIA Manual on Operation and Procedure.

DCWG0288
Mar 7, 1988

SANYO
BASEBAND INTERFACE IC



PROPOSED MODIFICATIONS FOR

EIA INTERIM STANDARD NO. 15

FEBRUARY 16, 1988

This Document is for Committee Use Only

Changes to the published standard are indicated on the left.

| Indicates changes made as of Jan 13, 1988
[Indicates changes made as of Feb 17, 1988

STANDARD BASEBAND (AUDIO/VIDEO) INTERFACE BETWEEN NTSC TELEVISION RECEIVING DEVICES AND PERIPHERAL DEVICES

1.0 BACKGROUND

Television manufacturers have responded to the cable television market by offering models which tune both broadcast and cable only channels. One or more cable channels may be scrambled or encrypted to support a marketing plan, e.g., tiering, premium extra-pay channels, etc., or for security reasons.

These scrambled or encrypted channels may be viewed by a subscriber through the use of a converter/decoder normally provided by a cable system operator. This converter/decoder will tune the full range of cable channels and decode or unscramble as necessary, providing an output to the subscriber's television receiver on a broadcast channel. The subscriber is thus unable to make a full use of remote tuning or other features of the cable compatible receiver. Additionally, confusion can arise from the need to employ two different remote transmitters to operate both the receiver and the converter/decoder. Also, unnecessary expense results from the duplication of tuning, IF and remote control systems.

One solution to the problem is to provide a baseband interface on the television receiver to accommodate a decoder designed to be compatible with this interface. It is not practical to provide for all possible interfaces or to accommodate every possible coding scheme. It is believed that the most urgent need will be met if the interface is designed in terms of baseband audio and video signals, together with appropriate control busses. Such signals are relatively standard and, thus, this same interface can be used with other peripheral devices, e.g., video discs, video tape recorders, teletext decoders, DBS or MDS receivers, and future consumer products.

The decoder interface, when used with a cable system, will permit the cable operator to reduce the cost of equipment which he normally provides to the subscriber and, at the same time, enable the subscriber to make full use of the features of a television receiver having the interface.

2.0 SCOPE

This interim standard defines the interface between a television receiver designed for the reception of either NTSC (CCIR System M) or cable transmissions with a cable system decoder, or other audio/video device. The interconnections are at baseband (audio and video). The possible configurations of the interface are detailed in Section 6.

3.0 GENERAL REQUIREMENTS

3.1 The interconnecting cable length is normally less than two (2) meters.

3.2 Sync regeneration by a decoder shall conform to the NTSC signal standards as defined in EIA Industrial Electronics Tentative Standard No. 1.

3.3 High or low AC line voltage shall not cause parameters to fall outside the specified ranges.

3.4 Synchronization provided by an external RGB (red/green/blue) source may be non-interlaced, but should otherwise be identical to NTSC signal standards.

3.5 Receiver performance specified herein shall be met over the full tuning range.

3.6 The luminance modulation, including data and sync, shall be between 12.5% - 100% at all times.

3.7 The connector specifications are to be found in Appendix B. The connector on the receiver shall be a female connector.

3.8 All peripheral equipment designed in compliance with this standard will normally have a "loopthru" 20 pin and shield connector, in addition to and identical in function to the original interface connector. All lines not simply wired through are to be buffered to attain the correct impedance and level at the second connector.

3.9 When operating with scrambling systems which do not derive audio from the sound carrier the receiver may not quiet the sound channel during acquisition unless a sound carrier is present.

3.10 The receiver should be designed in such a way as to withstand, in the "off" state, signals and terminations permitted in the "on" state. In addition, the receiver shall, when in the "off" state, provide no termination of a lesser impedance than that specified in the "on" state. It is assumed that in the "off" state the receiver shall provide some impedance to ground at each pin, possibly excepting the control lines, some of which or all of which may behave as though the receiver were on.

3.11 It is expected that video will always be present at Pin 19 of the receiving device, except during channel changing, even though the video is not being processed by the peripheral device.

3.12 A ground must always be provided on Pins 9 and 13 (RGB Gnd) of the receiving device even though the R-G-B option is not implemented.

4.0 RECEIVER INTERFACE DEFINITIONS

NOTE: Definitions of control logic, as used in this standard, are to be found in Appendix A.

4.1 Pin 1 - Audio Select Function (open collector logic)

This function permits the peripheral device to control the audio source of the receiver as follows:

OPTION	LEVEL
Internal Audio	High
External Audio (Pins 2 & 6)	Low

4.2 Pin 2 - Audio Input, Left Channel

4.2.1 - Amplitude at Equivalent of 100% Modulation shall be 400 mV RMS ± 150 mV RMS

4.2.2 - Input Impedance ≥ 10k ohms

4.3 Pin 3 - AGC Time Constant/Video Select Function (open collector logic)

Pin 3 works in conjunction with Pin 18 to select either the AGC time constant or the video source, as indicated in the following table:

Pin 3	Pin 18	AGC	Video Source
1	1	normal	internal
0	1	normal	external
1	0	fast	external
0	0	slow	external

NOTE: The receiver is to be designed with a slow and fast mode of AGC operation. In the "fast" AGC mode the receiver AGC time constant requirements are:

- o ≤ 1 msec for 6 dB increase (RF increment)
- o ≤ 2 msec for 6 dB decrease (RF decrement)
- o Test steps will be 0 - 6 dBmV and 6 - 0 dBmV
- 0 Tests will be made at 0 and 100 IRE unit flat fields
- 0 Test level change shall not occur during the vertical interval

NOTE: In the receiver "slow" AGC mode the time constant requirements are ≥ 20 msec tested as above.

4.3.1 The transient change in peak-to-peak video at Pin 19, in response to a change between any two time constant states, shall be <10%. This applies for times greater than 100 msec after a channel change with <12 dB RF level change.

4.4 Pin 4 - Audio Ground for Pins 2, 6 and 8.

4.5 Pin 5 - Second Audio Program (SAP) Select Function

This pin is used to indicate to the peripheral device that the SAP channel is to be selected.

OPTION	LEVEL
SAP Audio	low
Normal Audio	high

4.6 Pin 6 - Audio Input, Right Channel
See Section 4.2 for parameters.

4.7 Pin 7 - Linear RGB Input, Blue Channel

4.7.1 Sync Tip voltage

Sync tip, if present, with respect to blanking: -0.29 V _+_0.06 V into 75 ohms.

4.7.2 Blanking to color (100 IRE units) 0.71 V ± 0.07 V

4.7.3 RGB Input Termination 75 ohms ± 5% to ground. Coupling beyond the input terminating resistor may be AC or Direct-coupling.

4.7.4 Horizontal blanking must be present.

4.7.5 When the RGB mode is selected, the receiver shall accept the composite sync or composite video provided by a decoder on Pin 20 as an external composite sync input.

4.8 Pin 8 - Wideband Audio Output

4.8.1 Amplitude (into 10k ohms ± 1%) 1.2 V ± 3%

NOTE: Signal as in Section 4.19.1, with aural carrier deviation ± 75 kHz at 300 Hz

4.8.2 Output Impedance: 600 ohm ± 10%

4.8.3 Frequency Response: -3 dB point with respect to 300 Hz shall be > 90 kHz

4.8.3.1 Amplitude ripple with respect to 300 Hz over the range of 50 Hz to 47 kHz should be $\leq \pm$ 0.35 dB

4.8.3.2 Phase response from linear over the range of 50 Hz to 47 kHz should be $\leq \pm$ 3 degrees

4.8.4 Noise and Distortion

NOTE: All levels are with respect to a 25 kHz deviation (300 Hz rate) signal.

4.8.4.1 Thermal Noise: <-62 dB for a bandwidth of 15 kHz (no de-emphasis). Measured with no video modulation.

4.8.4.2 Buzz: <-50 dB for a bandwidth of 15 kHz. Video is a 100 IRE unit Flat Field.

4.8.4.3 Horizontal Components:

Harmonic of f_H	Limit (dB)
1,2,3	<-30
4,5,6	<-37

Video is a 100 IRE unit Flat Field.

4.8.4.4 Distortion: <2% THD for 70 kHz deviation at a 1 kHz rate. Measured with no video modulation Does not include horizontal components.)

4.9 Pin 9 - RGB Ground (This Pin will always be grounded at the receiver)

4.10 Pin 10 - Reserved for Future Application (No Connection)

4.11 Pin 11 - Linear RGB Input, Green Channel

See Section 4.7 for parameters

4.12 Pin 12 - Reserved for Future Application (No Connection)

4.13 Pin 13 - RGB Ground (This Pin will always be grounded at

4.14 Pin 14 - Channel Change and Power Indicator Function

This pin is used to indicate to a decoder when a channel change is in process and also the state of the receiver power. The decoder may sense the duration of signal dwell in the low state to identify channel change or receiver power off.

RCVR STATE	LEVEL
Power On	high
Channel Change in process	low for ≥ 5 msec and ≤ 2.0 sec
Power Off	low for > 2.0 sec

4.15 Pin 15 - Linear RGB Input, Red Channel

See Section 4.7 for parameters.

4.16 Pin 16 - Fast Blanking Function Input

4.16.1 Logic Levels (into 75 ohms to ground

Low (internal video): 0.0 V to 1.2 V
High (external RGB): 1.8 V to 3.0 V

4.16.2 Rise/Fall Time

> 40 nsec into 75 ohm load measured from maximum low level to minimum high level

4.17 Pin 17 - Video Ground

4.18 Pin 18 - Decoder Present Function and Decoder Restored Sync (DRS) (for AGC)

4.18.1 Impedance

Shall be 2k ohm ± 5% (tied to 5 V ± 0.5 V)

4.18.2 Sync Amplitude

The sync tip shall be the most negative part of the DRS signal by ≥ 200 mV (excluding chrominance).

4.18.3 Sync Tip Level

Shall be within 0.05 V of sync level presented to the decoder at Pin 19.

NOTE: The sync tip level of the decoder restored sync must vary in proportion to the receiver second detector output (i.e., video output Section 4.19) so as to be useful in driving the receiver AGC generator. When properly authorized, the decoder must restore a scrambled signal so that the sync tip level of output (Section 5.18)/input (Section 4.18) does not change between scrambled and unscrambled operation. Whenever proper receiver AGC is needed this signal must contain composite sync and may be a full composite video signal.

NOTE: The decoder restored sync output, measured relative to zero carrier level (2.14 V) is intended to be a replica of the sync that would be present if the signal were not scrambled. The decoder must therefore measure a recurring parameter(s) in the video from the receiver and cause the decoder restored sync to be nominal when the parameter is nominal, proportionally smaller than nominal when the parameter is smaller than nominal, and proportionally larger when the parameter is larger.

Suitable positive scale factor is to be chosen by the decoder design which will result in the sync pulse tip being equal to its scale factor times the recurring parameter amplitude. Decoder shall increase the sync tip output level relative to zero carrier in order to decrease the receiver's gain.

4.18.4 Logic Levels

This pin is used to indicate to a receiver when DRS is active and decoder is present. (See following:)

STATE	LEVEL
DRS active, decoder present	0 V to 3.0 V
DRS off, decoder not present	4 V to 5.5 V

NOTE: Decoder is only required to provide a dynamic range of 0.5V to 1.35V sync tip level DRS for AGC control.

4.19 Pin 19 - Receiver Video Output when terminated into 75 ohms to ground (from Antenna Input to Output to Peripheral Device)

NOTE: The receiver video at Pin 19 shall reach steady state within 0.5 sec of Pin 18 switching to the DRS active state.

4.19.1 Amplitude Response

Frequency	Amplitude
0.5 MHz	0 dB ± 2 dB
1.0 MHz	0 dB ± 0 dB
2.0 Mhz	0 dB ± 2 dB
3.0 MHz	0 dB +2 dB -4 dB
3.58MHz	0 dB +2 dB -6 dB
4.2 MHz	not specified
4.5 MHz	<-40 dB

15

NOTE: Data for Section 4.19.1 shall be taken with the input signal per NTC Report No. 7, Section 3.8, modulated to 75% with standard envelope delay predistortion and with an aural carrier 15 dB below the visual carrier.

NOTE: The 4.5 MHz measurement requires a separate test. Normally 4.5 MHz will not be present in the receiver output.

4.19.2 Chrominance - Luminance Delay Inequality <150 nsec

NOTE: Data for Section 4.19.2 shall be taken with the input signal per NTC Report No. 7, Section 3.7, modulated to 75% with standard envelope delay predistortion.

4.19.3 Differential Phase <5 degrees

NOTE: Data for Section 4.19.3 shall be taken with the input signal per NTC Report No. 7, Section 3.14, modulated to 87.5%.

4.19.4 Differential Gain <5%

NOTE: Data for Section 4.19.4 shall be taken with the input signal per NTC Report No. 7, Section 3.13, modulated to 87.5%.

NOTE: Sections 4.19.3 and 4.19.4 are intended to support video inversion scrambling.

4.19.5 Luminance Non-Linear Distortion $\leq$ 10 IRE units

(Measured at 10%, 50% and 90% APL as per NTC Report No.7, Section 3.9.)

4.19.6 Preshoot or Overshoot Amplitude $\leq$ 10%

(0-100 IRE unit luminance transition of the video signal with proper envelope delay distortion, 2T bar risetime and 75% modulation)

4.19.7 Absolute Value of Difference Between Percentage Preshoot and Percentage Overshoot
= [% Preshoot - % Overshoot] $\leq$ 5%
(Use the same test condition as Section 4.19.6.)

4.19.8 Video Amplitude

Blanking to Peak White	0.71 V $\pm$ 0.10 V
Sync tip to Blanking	0.29 V $\pm$ 0.06 V

4.19.9 Sync Polarity — Negative

4.19.10 Output Impedance — 75 ohm ± 5% (Direct-coupled)

4.19.11 DC Level at 100 IRE units — 2.00 V ± 0.1 V

4.19.12 The instantaneous video level shall be confined between 0 volts and +3.0 volts.

4.19.13 Minimum Dynamic Range — 0.5 V to 2.14 V

NOTE: This benefits acquisition where gain is most likely high, and could result in excessive distortion (particularly by noise inverters).

4.20 Pin 20 - Receiver Video Input

4.20.1 Video Amplitude Accepted (Sync tip to peak white) — 1.00 V ± 0.25 V

4.20.2 Sync Polarity Accepted — Negative

4.20.3 Input Termination — 75 ohm ± 5% to ground
(Coupling beyond the input terminating resistor may be AC or Direct-coupling.)

4.20.4 Return Loss (3.58 MHz relative to 75 ohm) — ≥ 20 dB

4.20.5 When a peripheral device is connected, receiver synchronization shall be controlled via Pin 20.

5.0 PERIPHERAL DEVICE INTERFACE DEFINITIONS

NOTE: Definitions of control logic, as used in this standard, are to be found in Appendix A.

5.1 Pin 1 - Audio Select Function (open collector logic)

This function permits the peripheral device to control the audio source for the receiver as follows:

OPTION	LEVEL
Internal Audio	High
External Audio (Pins 2 & 6)	Low

5.2 Pin 2 - Audio Output, Left Channel

NOTE: The peripheral device may be required to drive a load consisting of Pins 2 and 6 connected together inside the receiver via impedances of not less than 10k ohm to permit the use of a stereo peripheral device with a mono receiver. (See Figure 1)

5.2.1 - Amplitude at Equivalent of 100% Modulation shall be 400 mV RMS ± 150 mV RMS into 10k ohm load.

5.2.2 - Output Impedance ≤ 1k ohm

5.3 Pin 3 - AGC Time Constant/Video Select Function (open collector logic)

Pin 3 works in conjunction with Pin 18 to select either the AGC time constant or the video source, as indicated in the following table:

Pin 3	Pin 18	AGC	Video Source
1	1	normal	internal
0	1	normal	external
1	0	fast	external
0	0	slow	external

NOTE: When the receiver is tuned to a non-encoded NTSC signal, a decoder shall place the receiver in the normal AGC mode within 5 seconds.

5.3.1 The transient change in peak-to-peak video at Pin 19, in response to a change between any two time constant states, shall be <10%.

5.4 Pin 4 - Audio Ground for Pins 2, 6, and 8.

5.5 Pin 5 - Second Audio Program (SAP) Select Function

This pin is used by the receiver to indicate to the peripheral device that the SAP channel is to be selected as the audio source to the receiver.

OPTION	LEVEL
SAP Audio	low
Normal Audio	high

5.6 Pin 6 - Audio Output, Right Channel

See Section 5.2 for parameters.

5.7 Pin 7 - Linear RGB Output, Blue Channel

NOTE: It is recommended that nominal black level set-up (from blanking) of 7.5 IRE units be provided. It is anticipated that the receiver will use blanking level clamps, therefore, any variance in the set-ups of R G B black levels may introduce grey scale errors in the receiver.

5.7.1 Sync Tip voltage

Sync tip, if present, with respect to blanking: -0.29 V ± 0.06 V into 75 ohms.

5.7.2 Blanking to color (100 IRE units): 0.71 V ± 0.07 V

5.7.3 RGB Blanking DC Level 0.0 V ± 2.5 V

5.7.4 RGB Termination 75 ohms ± 5% to ground. Coupling beyond the input terminating resistor may be AC or direct-coupling.

5.7.5 Horizontal blanking must be present.

5.7.6 Source impedance for external RGB (direct coupled) 75 ohm ± 5%

5.8 Pin 8 - Wideband Audio Input

5.8.1 Amplitude (into 10k ohms ± 1%) 1.2 V ± 3%

5.8.2 Input Impedance (AC coupled) ≥10k ohm

5.8.3 Frequency Response: 3 dB point with respect to 300 Hz shall be > 90 kHz

5.8.3.1 Amplitude ripple with respect to 300 Hz over the range of 50 Hz to 47 kHz shall be ± 0.35 dB

5.8.3.2 Phase response from linear over the range of 50 Hz to 47 kHz shall be ± 3 degrees

5.8.4 Noise and Distortion

NOTE: All levels are with respect to a 25 kHz deviation (300 Hz rate) signal.

5.8.4.1 Thermal Noise: <-62 dB for a bandwidth of 15 kHz (no de-emphasis). Measured with no video modulation.

5.8.4.2 Buzz: <-50 dB for a bandwidth of 15 kHz. Video is a 100 IRE unit Flat Field.

5.8.4.3 Horizontal Components:

Harmonic of $f_{(H)}$	Limit (dB)
1,2,3	<-30
4,5,6	<-37

Video is a 100 IRE unit Flat Field.

5.8.4.4 Distortion: <2% THD for 70 kHz deviation at a 1 kHz rate. Measured with no video modulation. (Does not include horizontal components.)

5.9 Pin 9 - RGB Ground (This Pin will always be grounded at the receiver)

5.10 Pin 10 - Reserved for Future Application (No Connection)

5.11 Pin 11 - Linear RGB Output, Green Channel

See Section 5.7 for parameters

5.12 Pin 12 - Reserved for Future Application (No Connection)

5.13 Pin 13 - RGB Ground (This Pin will always be grounded at the receiver)

5.14 Pin 14 - Channel Change and Power Indicator Function

This pin is used to indicate to a decoder when a channel change is in process and also the state of the receiver power. The decoder may sense the duration of signal dwell in the low state to identify channel change or receiver power off.

RECEIVER STATE	LEVEL
Power On	high
Channel Change in process	low for $\geq$ 5 msec and $\leq$ 2.0 sec
Power Off	low for > 2.0 sec

5.15 Pin 15 - Linear RGB Output, Red Channel

See Section 5.7 for parameters.

5.16 Pin 16 - Fast Blanking Function Output

5.16.1 Logic Levels (into 75 ohms to ground)

Low (internal video): 0.0 V to 1.2 V
High (external RGB): 1.8 V to 3.0 V

5.16.2 Rise/Fall Time

> 40 nsec into 75 ohm load measured from maximum low level to minimum high level

5.16.3 Output Impedance/Drive Capability: 75 ohm ± 5% capable of driving a 75 ohm load

5.17 Pin 17 - Video Ground

5.18 Pin 18 - Decoder Present Function and Decoder Restored Sync (for AGC)

5.18.1 Load Impedance at Receiver

Shall be 2k ohm ± 5% (tied to 5 V ± 0.5 V)

5.18.2 Sync Amplitude

The sync tip shall be the most negative part of the DRS signal by ≥ 200 mV (excluding chrominance).

5.18.3 Sync Tip Level

Shall be within 0.05 V of the sync level extrapolated to that of an equivalent non-scrambled signal presented at Pin 19

NOTE: Decoder Restored Sync (DRS) allows the decoder to control the receiver's AGC system. (In the active state) this signal must contain composite sync, and may be a full composite video signal. DRS is intended to provide a replica of non-scrambled sync for the purposes of AGC. The DRS sync timing shall be coincident with the sync at Pin 20.

An expression describing the sync tip voltage with respect receiver gain is as follows:

DRS Sync Tip Voltage = Vo-(Vo-Vs)/Am
= 2.143-1.143/Am

where Vo = nominal zero carrier voltage (2.143V)
Vs = the nominal sync tip voltage (1.0V)
Am = desired (linear) gain.

The sync tip level of DRS must vary in the same manner as non-scrambled video sync would vary for a particular receiver gain. The decoder must therefore measure a recurring parameter(s) in the video from the receiver and cause the decoder restored sync to be nominal when the parameter is nominal, proportionally smaller than nominal when the parameter is smaller than nominal, and proportionally larger when the parameter is larger.

In addition to responding to DRS, receiver video amplitude may be subject to variations due to RF level changes, Average Picture Level (APL), non-suppressed sync, etc. To maintain correct video amplitude and assure

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system stability, DRS must be updated in accordance with Section 5.18.4.

Suitable positive scale factor is to be chosen by the decoder design which will result in the sync pulse tip being equal to its scale factor times the recurring parameter amplitude. Decoder shall increase the sync tip output level relative to zero carrier in order to decrease the receiver's gain.

5.18.4 DRS Open Loop Response Time

Decoder response time to changes at Pin 19 (to be measured from the the application of a 1 dB step change in composite video at Pin 19 to the 90% settling point at Pin 18) shall be $\leq$ 1.0 msec.

NOTE: The sync tip level of the decoder restored sync must vary in proportion to the receiver second detector output (i.e., video output Section 4.19)so as to be useful in driving the receiver AGC generator. When properly authorized, the decoder must restore a scrambled signal so that the sync tip level of output (Section 5.18)/input (Section 4.18) does not change between scrambled and un-scrambled operation. Whenever proper receiver AGC is needed this signal must contain composite sync and may be a full composite video signal.

5.18.5 Decoder Acquisition Time after Authorization < 5 sec

This is the maximum time from signal input until return of correct sync to the receiver.

5.18.6 Decoder Transparency

Upon notification of a channel change command, a decoder shall transparently connect Pin 19 to Pin 18 and retain same throughout the acquisition time. If the signal is to be decoded or otherwise monitored then the decoder shall provide Decoder Restored Sync (DRS) on Pin 18, otherwise it shall drive Pin 18 high.

5.18.7 Logic Levels

This pin is used to indicate to a receiver when DRS is active and a decoder is present as follows:

STATE	LEVEL
DRS active, decoder present	0 V to 3.0 V
DRS off, decoder not present	4 V to 5.5 V

5.18.8 DRS Dynamic Range 0.5V to 1.35V (min range)

NOTE: This benefits acquisition where gain is most likely high, and would result in excessive distortion (particularly by noise inverters).

5.19 Pin 19 - Peripheral Video Input (from Receiver)

5.19.1 Input Termination 75 ohm ± 5% to ground

5.19.2 Return loss at 3.58 MHz relative to 75 ohm ≥ 20 dB

NOTE: Receiver video at Pin 19 may not be present for a maximum of 0.5 sec following Pin 18 being switched to the DRS active state.

5.20 Pin 20 - Peripheral Video Output

5.20.1 Video Amplitude (Sync tip to peak white) 1.00 V ± 0.25 V

5.20.2 Sync Polarity Negative

5.20.3 Input Termination at Receiver 75 ohm ± 5% to ground
Coupling beyond the input terminating resistor may be AC or Direct-coupling.

5.20.4 Decoder Video Gain 1 ± 0.1

5.20.5 Decoder Sync Compression ≤ 30%

From Pin 19 to Pin 20, tested with video input of 1.5 V sync tip to peak white

5.20.6 Decoder Video Frequency Response

Frequency	Amplitude
0.5 MHz	0 dB ± 2 dB
1.0 MHz	0 dB ± 0 dB
2.0 Mhz	0 dB ± 2 dB
3.0 MHz	0 dB ± 2 dB
3.58MHz	0 dB ± 2 dB
4.2 MHz	0 dB ± 2 dB

NOTE: Data for Section 5.20.6 shall be taken using the multiburst signal per NTC Report No. 7, Section 3.8.

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5.20.7 Chrominance - Luminance Delay Inequality ±20 ns

NOTE: Data for Section 5.20.7 shall be taken with the input signal per NTC Report No. 7, Section 3.7, modulated to 75% with standard envelope delay pre-distortion.

5.20.8 Decoder Differential Phase ± 3 degrees

NOTE: Data for Section 5.20.8 shall be taken with the input signal per NTC Report No. 7, Section 3.14, modulated to 87.5%.

5.20.9 Decoder Differential Gain ± 3%

NOTE: Data for Section 5.20.9 shall be taken with the input signal per NTC Report No. 7, Section 3.13, modulated to 87.5%.

NOTE: Sections 5.20.8 and 5.20.9 are intended to support video inversion scrambling keyed to fade to black.

5.20.10 Decoder design is expected to stabilize the back porch of the sync interval to permit the receiver to clamp on the back porch to generate a stable black level.

5.20.11 The instantaneous video level shall be confined between ± 3.0 volts.

5.20.12 Sync regeneration by a decoder shall conform to the NTSC signal standards as defined in EIA Industrial Electronics Tentative Standard No. 1.

5.20.13 When in the RGB mode, composite sync or composite video output shall be provided on Pin 20.

NOTE: It is recommended that there be a 500 nsec advance of RGB sync from peripherals (with respect to RGB and fast blanking).

6.0 INTERFACE OPTIONS

[6.1 This standard allows for two possible interfaces. The
[particular interface included in an equipment is to be
[conspicuously marked near the plug. The possible interfaces
[and corresponding receiver markings are:

OPTION	LABEL
NTSC	EIA - XXX
NTSC + Y/C + Color Difference	EIA - XXX - Y/C